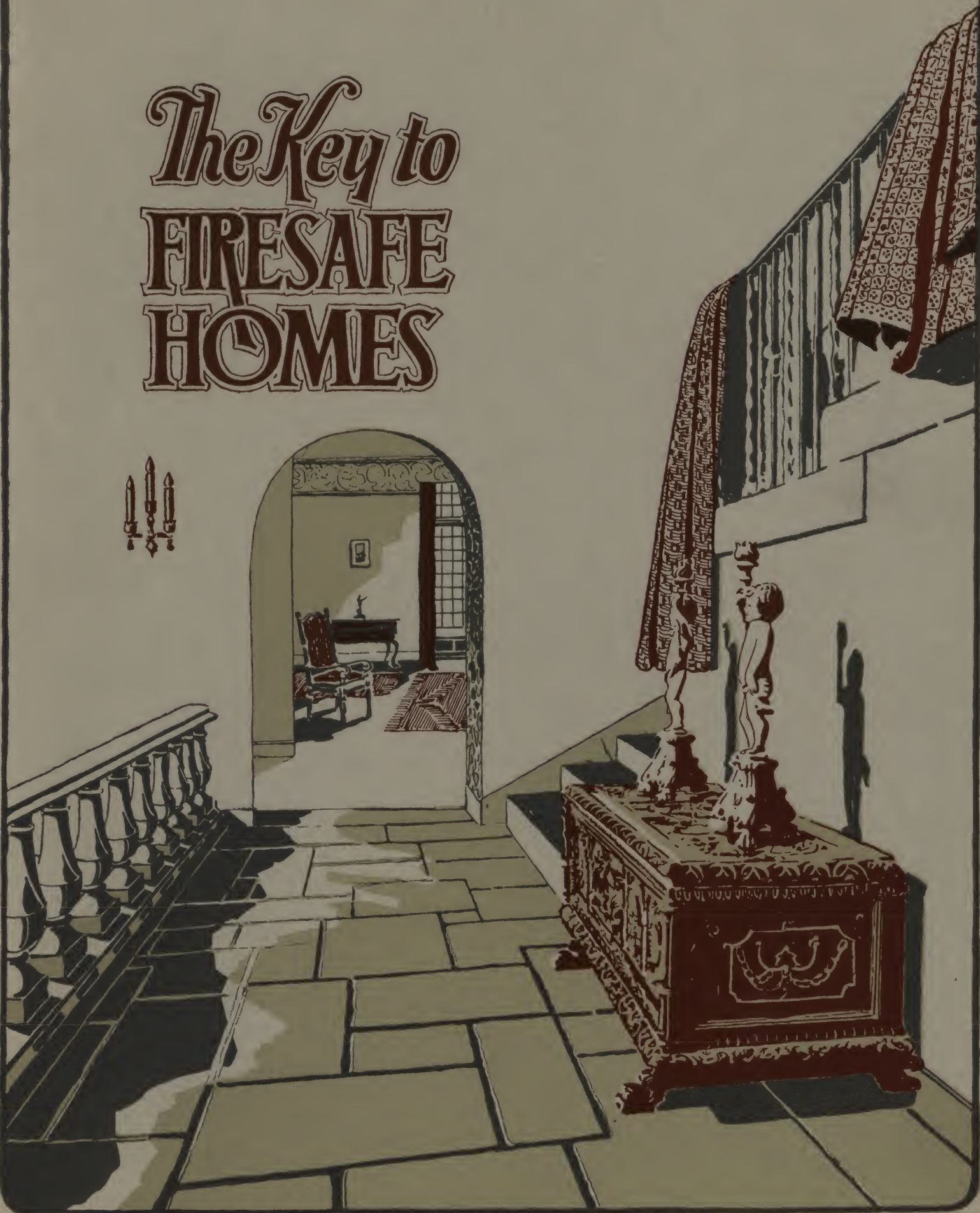


The Key to **FIRESAFE HOMES**



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The Key to **FIRESAFE HOMES**

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 I. H. WOOLSON, CONSULTING ENGINEER

November 18, 1926

Mr. W. D. M. Allan, Manager,
 Cement Products Bureau,
 Portland Cement Association,
 33 West Grand Avenue,
 Chicago, Illinois.

My dear Mr. Allan:

You ask my opinion as to the desirability of making the first floor fire-resistive over the cellar or basement in an ordinary dwelling. I have long been convinced that such construction is highly desirable and would offer a large measure of fire protection at a small additional cost. I always recommend such a floor irrespective of the general construction of the building.

There are various types of fire-resistive floors suitable for use in dwellings and one can be chosen appropriate for the character of the building. No harm results if the floor has a large factor of fire safety; in other words, if it be a bit too good.

A fire-resistive first floor with no openings through it except a stairway enclosed by a fire-resistive partition and door at the bottom is a wonderful protection in a home against spread of fire from a cellar, and that is where a large portion of dwelling house fires originate. With superior construction such a fire could burn itself out without injuring other portions of the house, and any good construction should resist a fire long enough to enable fire-fighting equipment to extinguish it.

The increasing desirability of having a garage located under a dwelling is an added incentive to the necessity for a fire-resistive first floor. In this case, however, certain fire insurance requirements as to doors and windows must also be complied with.

Yours very truly,

Ira H. Woolson
 Consulting Engineer

IHW:BDS



THE late Ira H. Woolson, for many years consulting engineer of The National Board of Fire Underwriters, was an early advocate of fire-resistive floor construction as is evidenced by this letter.

The Key to **FIRESAFE HOMES**

THAT fire-hazardous construction can no longer be tolerated is evidenced by the fact that in the United States each year fire exacts a toll of more than 14,000 lives and causes property losses amounting to over \$500,000,000.

And a considerable percentage of this great waste of property and immeasurable loss of life is the result of residence fires. Reliable statistics show that every five minutes a house bursts into flames. More than thirty persons lose their lives in fires every day! It is increasingly apparent, then, that homes must have built-in firesafety.

Rapid progress has already been made in this direction with the result that houses having incombustible walls and roofs are becoming more popular until today such construction is the approved and accepted type. Hence the familiar brick, tile, stone and concrete masonry walls and the roofs of slate, cement-asbestos shingles, clay and concrete tile. These all effectively reduce the hazard of the wandering spark, forming a permanent, fire-resistive barrier against fires of *exterior* origin.

Still there are fires. Despite the increasing use of firesafe walls and roofs for dwellings, fires of *interior* origin continue to snuff out lives and destroy valuable property—homes and personal possessions. Incombustible walls and roofs alone cannot prevent the appalling losses of life and property; there is a need for firesafe floors as well in all dwellings.

Many Residence Fires Originate in Basements

All too familiar is the desolate picture of the walls of a house standing alone after a fire. Such destruction could have been prevented had the floors as well as the walls been of firesafe construction. Particularly in the case of the first floor is this true, for a large portion of residence fires are known to originate in basements. In other words, a great many fires begin down around the heating plant. Ashes carelessly handled, defective or improperly attended boilers, furnaces or other heating devices, and piles of old papers or rubbish are frequently the sources of destructive fires in residences.

National Board of Fire Underwriters "The remedy," says the National Board of Fire Underwriters in its booklet *Dwelling Houses*, "is to confine such fires at the place of origin by a cut-off between the cellar and the story above. . . . The best possible cut-off is a fireproof floor. . . . Such floors may be constructed of steel I-beams with stone or cinder concrete, tile or other approved fireproofing between them and with suitable protection for the bottoms of the beams; or steel beams may be omitted and the floor constructed entirely of reinforced concrete; or a composite construction of reinforced concrete beams filled between with tile or metal or plaster forms with a concrete covering may be employed.

"In buildings where steel beams are not otherwise used, it is probable that some variety of reinforced concrete floor con-



Below — Living room in residence of J. F. Conrin, Los Angeles, California, which has concrete tile floor that harmonizes with the concrete walls and staircase and the rich furnishings.

Above—Concrete art marble floor and stairway portray architectural beauty and provide firesafety in residence of Z. C. Patten, Jr., Chattanooga, Tennessee. Clarence T. Jones, Architect.



Left—Beauty and character developed in the concrete slab itself. This floor, in the residence of Fred R. Johnson, Beverly Hills, California, has been colored, marked off to resemble tiling and then polished. Harry McAfee, Architect.



struction would be the simplest and most economical. The forms could be easily supported, no hoisting of concrete would be necessary, and as the first floor would be laid before the rest of the building was erected, all the form lumber could be used again for other purposes. . . .

Reliable building constructors state that such concrete floors can be built in most localities at practically the same price as first class wooden construction. Owing to the fact that the fireproof floor is also waterproof, vermin-proof, and thoroughly rigid, it would justify increased cost. If desired, a wooden finish flooring may be laid over the concrete."

Three Types of Concrete Floors in General Use

Types of concrete residence floor construction now in general use — solid slab, ribbed, and tile and joist — are shown in detail on pages 16, 17 and 18.

Design and form details for beams and basement columns are shown on pages 19 and 20. Information on specifications and additional details of construction are given in a booklet, "*Concrete Floors*," copy of which can be obtained free on request to the nearest district office of the Portland Cement Association. (See list on page 1.)

The recent introduction of light weight steel joists and metal lumber has made possible an additional type of firesafe floor for residences. In construction of this kind

the concrete floor slab is supported by steel joists each of which is encased in a fire-resistive covering of concrete.

Floors of Concrete Excel in Convenience, Beauty and Comfort

The personal contact of the occupants of a dwelling with its structural parts is confined almost entirely to the floors. Consequently, the day-to-day satisfaction in the use of a dwelling is determined very largely by its floors—their

appearance, the way in which they resist wear, their smoothness and their sanitary qualities. Further, since floors are the part subjected to the greatest wear, they determine largely the serviceability and even the life of a residence.

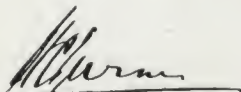
Concrete floors in residences, except in those of the most elaborate class, were practically unheard of ten years ago. Their ability to resist wear, their smoothness and their sanitary qualities were readily ad-

Desirable and Not Costly

"The desirability of a firesafe first floor of concrete in the home, as a needed protection against cellar fires, cannot seriously be questioned. The majority of the fires originate in the cellar.

"The fire hazard of the cellar is so real that the Tenement House Commission in New York, which is charged with responsibility for safeguarding the welfare of dwellers in apartment houses, requires that the floor over the cellar or basement shall be of incombustible construction.

"Surely the family in its own home should seek the same measure of protection. Many lives lost every year from fires add emphasis to the movement for firesafe construction in the home as well as elsewhere. The additional cost of a concrete fire-resisting first floor is not large."



H. C. TURNER, *President*
Turner Construction Company
New York, December 10, 1926

mitted, but these important advantages were apparently overshadowed by preconceived notions regarding hardness and unattractiveness. The greatest fallacy in these early conceptions evidently lay in the basis of comparison, which seems to have been the concrete sidewalk. No one would care for a living room floor that resembled an ordinary sidewalk. Yet with the same material of which the sidewalk is made—concrete—it is possible to construct residence floors which possess many desirable



Left—Linoleum laid over concrete floor in children's playroom, Emlen Arms Apartment, Philadelphia, Pennsylvania. The surface of the floor covering has been waxed and polished.

Below—Concrete floor in the kitchen shown here has been surfaced with rubber floor covering cemented to the permanent, firesafe base.



Below—This unique circular dining room has been made doubly attractive with a floor surfaced with tiles laid over concrete.



For All Fireproof Structures

"The use of concrete floors for residences is a subject of great interest to architects in general and to me in particular as I believe that in all fireproof structures concrete floors should be used.

"I know by personal experience that if color is mixed in concrete and is floated smooth and oiled, it makes a very beautiful floor from the decorative standpoint. I go so far as to say I prefer it to terrazzo for hotels and apartments and buildings of that character."

Alfred Granger

ALFRED GRANGER, *Architect*
Chicago, December 13, 1926

attributes and are unexcelled in qualities of comfort, beauty and convenience.

With many of the numerous types of artistic coverings, some of which are later described, a floor can have the firesafe and structural advantages of concrete and still be resilient where this quality is required.

"Twenty years ago I built a concrete floor," says Irving J. Gill, architect, in the *Sunset Magazine*. "I expected it to be cold. I expected it to be damp. I expected it to be all the uncomfortable things people said it would be. I found it warm and dry and all the comfortable things people said it would not be. Best of all, I knew it would never harbor the vermin of sorts that infest old wooden flooring like mice that scamper at night Concrete floors are cheaper than wood for the first story; they are enduring, they require a minimum of care, they are comfortable and healthful when laid right, and they can be more beautiful than any other floor."

Structural Advantages of Concrete Floors are Factors of Importance The structural advantages of concrete floors are numerous.

Besides firesafeness, which is perhaps their most important feature, they are entirely free from sagging, deflection or lateral movement and consequently minimize plaster cracking on walls and ceilings. Most plaster cracks in dwellings are due to sagging or other movement of ordinary floors, exerting stresses in the walls which are then transmitted to the plaster. Concrete floors give greater rigidity to the structure, eliminating vibration caused by heavy city traffic or by movement within the house. They also provide greater stability, a feature of particular importance in areas subject to earthquake shocks. Concrete floors are efficient sound deadeners due to the fact that their smooth surfaces tend to reflect sound rather than transmit it, while some coverings used on concrete residence floors will actually absorb sound.



Extensive use has been made of concrete in this living room—cast stone fireplace, portland cement plaster walls and concrete floor tile of pleasing pattern laid over concrete sub-floor.



Above—The rugged beauty in this portion of the W. H. Hanson residence, Flintridge, California, is the result of an artist's handiwork with concrete. H. Hewitt, Architect.

Below—This concrete floor in the residence of Garfield D. Merner and Delight Ward Merner, Hillsborough, Calif., is as permanent as it is beautiful. Willis Polk and Company, Architects.



Left—Concrete tile, waxed and polished, form this floor in residence of R. C. Johnson, at Cincinnati, Ohio. Concrete cast stone fireplace and portland cement plaster add to the beauty. U. C. Ewing, Designer and Builder.

**Hotels, Apartments,
Large Buildings Have
Floors of Concrete**

For many years concrete floors have been used extensively in hotels, clubs, fine homes, apartments, and in public buildings everywhere because of their firesafe and structural qualities. The average home owner, entertaining the thought that concrete floors were undesirable, has appreciated the comfort, the convenience and the luxury of such structures unaware of the fact that the floors beneath him were firesafe slabs of reinforced concrete.

The slowness of the home builder to realize the desirability of concrete floors in residences cannot be blamed entirely upon him for at least two very good reasons. The first is that in larger buildings, the concrete floors generally have been covered or surfaced—usually by methods now commonly used in dwellings—in such a manner as to entirely escape the sidewalk resemblance and the second, that until recent years the construction cost of concrete residence floors was believed to be excessive.

COVERINGS FOR CONCRETE FLOORS

Much could be said on the subject of floor coverings. It is quite reasonable to assume, however, that any type of covering in vogue can be applied successfully over concrete. Most of them have been, as is evidenced by the accompanying illustrations.

**Hardwood—
Maple, Birch,
Beech, Oak**

The finest hardwood floors—maple, birch, beech or oak—can be nailed to wooden strips embedded in the concrete or secured with floor clips so embedded, where a wood surface is desired. Such practice is common in living and dining rooms, and floors so laid will not sag, creak or become warped.

Use of Linoleum, Linoleum—plain, inlaid, **Cork and Rubber** jaspe or embossed—and rubber flooring laid either in sheets or as tile, in the many pleasing and artistic color combinations offered, are frequently used in

several or all rooms and hallways of the house. Cork flooring and cork tile are similarly used. These types provide a resilient surface, yet due to the firmness of the base to which they are secured, they will neither bulge nor pull loose. Coverings under this general classification are cemented or pasted to the concrete over the entire surface. In every case, manufacturers' specifications for preparation of

Costs Only 1½ Per Cent More

"I was very much astonished when, about three years ago, I discovered that concrete floor slabs would increase the cost of a residence so little (about 1½ per cent) that it seemed absurd not to use them instead of wooden joists. One of the greatest troubles today in residence construction is caused by the shrinkage of the ordinary building materials used for floor construction until ugly cracks appear in plastered walls and ceilings. There is a remedy for this trouble—one that is not at all costly and which minimizes plaster cracking to a great extent.

"So since then, to say nothing of the fireproof qualities of concrete slabs, I have always recommended their use for all residence floor construction as far as possible and it is a tremendous satisfaction to see a house come through its first heated season without the plaster cracks that used to be such a source of unavoidable annoyance.

"This non-moving quality of concrete floor slabs in a fine residence saves the owner a tremendous lot of redecorating and is, to my mind, the first of its benefits, although it has many others."

Russell S. Walcott

RUSSELL S. WALCOTT, *Architect*
Chicago, December 18, 1926



Concrete floor in hall, residence of Asa V. Call, Los Angeles, California.* Stanton, Reed and Hibbard, Designers and Builders.



Rubber flooring in tile pattern laid over concrete.



Light brown jaspe linoleum has been laid over concrete sub-floor. Residence of J. Raymond Young, Minneapolis, Minnesota.



WIDE variety of floor coverings for concrete residence floors to suit all home owners. Illustrates many ways in which floors can be made beautiful in the concrete slab itself.

Floors constructed of permanent materials are an important part of the interior decorations of the house, providing



A concrete floor covered with small tiles laid in a pattern that adds to the attractiveness of the room.



Slate floor laid over base of permanent concrete.



Concrete floor and tiling in residence of C. W. De Long, Coral Gables, Florida. H. George Fink, Architect.

ings and finishes permit treatment of
it the whims or tastes of practically
ons shown here depict a few of the
surfaced—with rubber flooring, slate,
tilling or by developing character and

concrete, finished in keeping with the
side built-in firesafety that endures.



an interesting pattern is the very foundation
d in this sun room.



Concrete tile in an unusual and striking pattern. Sun room, residence of W. B. Saul, Philadelphia, Pennsylvania. Simon and Simon, Architects.



Above—Polished concrete floor in Kenneth McDonald residence, Los Angeles, California. Note the irregular markings and the tile-embedded stairs. Kenneth McDonald, Architect.



Below—Concrete floor in private dining room, Forest Park Hotel, St. Louis, Missouri. Note use of concrete tile for wall decoration. George D. Burnett, Inc., Architect.

Better Plastering Assured

“Relative to the use of fireproof floors of reinforced concrete for homes.

“It has long been recognized that such floors are the only proper ones for office buildings, schools, churches, etc., and the only reason they have not been used more in homes is that they have not been advocated enough—a lack of sales campaigns. People will not demand a product, however good, that they do not know about.

“With the increased demand for tile and composition floor finishes the concrete floor slab can be sold more easily and the advantages of having a floor that is fireproof and will not shrink or settle (with the result that a better plastering job can be guaranteed) are numerous.”

Paul Hueber

PAUL HUEBER, *Architect*

Syracuse, N. Y., December 21, 1926.



Below—Hardwood flooring laid over concrete in residence at Phillipsburg, New Jersey. Paul Smith, Architect.

surface and instructions for laying should be followed carefully.

Terrazzo, Ceramics, Marble, Mosaics, Art Marble, Slate and Concrete Floor Tile In the group of hard surfacings are terrazzo, the ceramics and marble mosaics, slate, concrete tile and art marble. Great freedom in design and color is now possible with all of these materials, assuring floors that not merely supplement but which frequently dominate the beauty of interior design. A terrazzo floor finish is a surface of irregular marble or granite fragments embedded in cement mortar and ground smooth. Mineral pigments are frequently added to the mortar to produce a desired general tone. Ceramic tiles in many colors are found in hallways, sun and dining rooms and in bathrooms. Slate, laid in irregular patterns and waxed and polished is very pleasing.

The development of concrete tile and art marble has been rapid, both offering large

variety in color and design. Concrete tile are frequently used in living rooms, where they form an artistic frame for fine rugs. Art marble resembles terrazzo in many respects. Its manufacture is highly specialized and installations are made in sections like tile. Illustrations covering most of these types are included; while they are by no means confined to such usage, their most general application is in sun rooms and entrance halls. In each case, with the exception of terrazzo which is placed in sections up to ten feet square, the surfacing units are laid or embedded in cement mortar over the base flooring of concrete.

Simple Processes Perhaps no other method of finishing has enjoyed **Develop Beauty in the Concrete Slab** such recent success and prominence as that which develops beauty and character in the surface of the concrete slab itself. Such a floor is obviously the most economical and by many it is considered the most beautiful. The method

Prejudice Proved Groundless

"As I see it, in the present state of the art of building, including the cost of labor and material, it is unnecessary and inexpedient for any residence, apartment or hotel building housing people to be built of any other than non-burnable material. Unburnable residences of four to fifteen rooms can be built just as beautiful and more durable and at no greater cost or at less cost today than buildings of the ordinary type where wood is used to so great an extent for structural and finishing members.

"Reinforced concrete floors can be built in any building having masonry walls without extra expense if the designer knows how to use the materials economically.

"There is a public prejudice against the use of hard floors on two counts: first, that they are said to be cold and second, that they are said to be hard to live on. Both of these prejudices have proved to be groundless. In all cases where I have used these floors in residences, no more rugs are used on these floors and in some instances not as many as would be used on wood floors. The amount of labor required to keep them clean and polished and good looking is very much less than would be required for any hard wood floor, and the people after living on them do not find them uncomfortable, but on the contrary feel more comfortable. They also find that instead of the hard floor finish being cold that it actually retains the heat of the house longer than wood floors and many times feels warmer than wood floors for the reason that the heat of the house has been retained in the floor during the night when the windows are open."

Henry K. Holzman

HENRY K. HOLSMAN, *Architect*
Chicago, December 20, 1926

Solid Slab Type of Concrete Floor Construction



Placing reinforcement for concrete floor slab.



Completed concrete floor slab for small residence.



Carpenters setting and leveling wooden sleepers to which sub-flooring will be nailed.



Filling in around sleepers with concrete. This gives firm, fire-resisting construction.

Ribbed Type of Concrete Floor Construction



Close-up view of forms used in this type of floor. Piping and electric conduits being laid preparatory to placing concrete.



Complete forms for ribbed floor. Note vertical metal pipes placed wherever openings in concrete will be needed.



Ribbed concrete floor resting on a concrete masonry wall. The floor is covered with sand to insure proper curing.



View of basement ceiling showing joists of reinforced concrete and interior of concrete masonry foundation wall.

involves several processes including the use of mineral pigments, stains and chemicals to develop color, and oiling, waxing and polishing. Several companies manufacture compounds which produce color in concrete. The manufacturers also frequently market special processes for surface finishing.

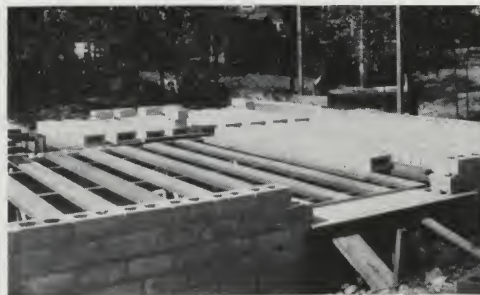
The surface coat of the concrete floor is often marked off into square or other patterns to resemble tiling. When colored in tones of dark red or green or brown or other desirable colors and subsequently treated with oil and filler, then waxed like hardwood, concrete floors assume the rich effect of old Spanish leather and provide an unsurpassed background for rugs and furniture. A concrete floor is impervious to moisture. In addition, very little effort is required to keep it clean, polished and good looking at all times.

The Key to Firesafe Homes As for the matter of cost, figures which have been assembled from many actual jobs and contractors' estimates indicate that substitution of a concrete first floor for the ordinary wood joist floor increases the total cost of the residence only $1\frac{1}{2}$ to 2 per cent. This fact is surprising to those who have considered concrete residence floors a luxury, yet it has been proved by experience. It is entirely possible, of course, to select an elaborate finish or an expensive covering which may materially increase the cost. However, in the average modest residence, where the pocketbook has as much to do with the floor finish as does artistic taste, a pleasingly surfaced concrete first floor—the key to firesafe homes—can be built for a figure which will be well within the limits of the two per cent.

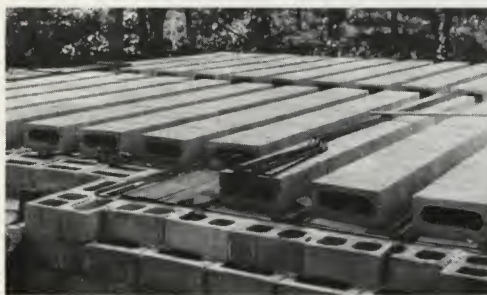
Tile and Joist Type of Concrete Floor Construction



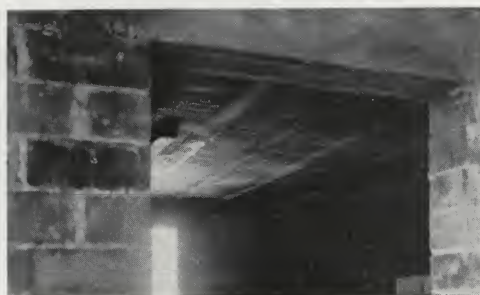
Erecting forms for tile and joist concrete floor construction.



Forms with some of the concrete tile fillers in place.

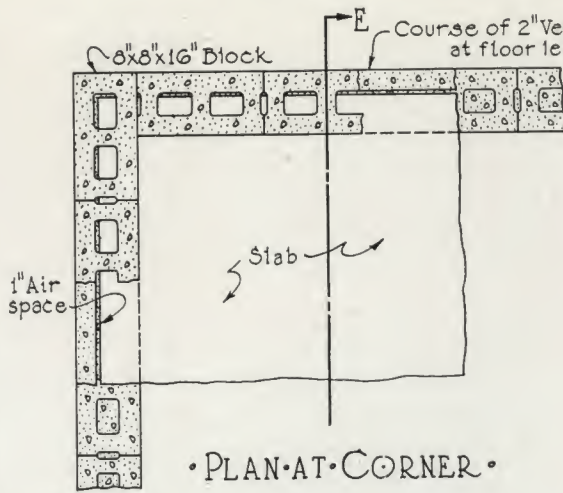


Steel reinforcing bars, placed in joist between rows of tile, give tensile strength.

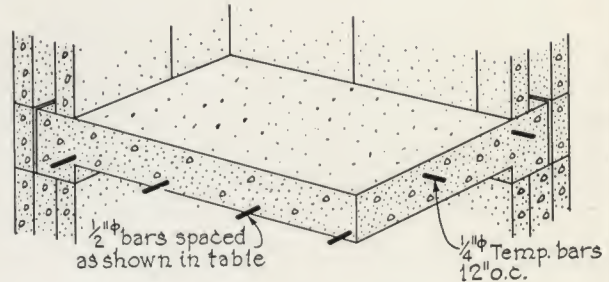


View of basement ceiling. Bond between concrete and tile holds latter in place.

• SOLID • SLAB • CONSTRUCTION •

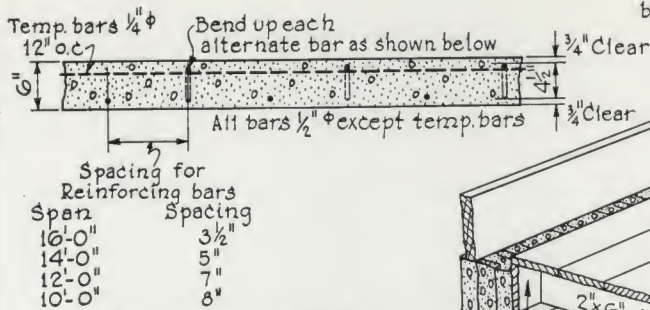


• PLAN • AT • CORNER •



• PERSPECTIVE •

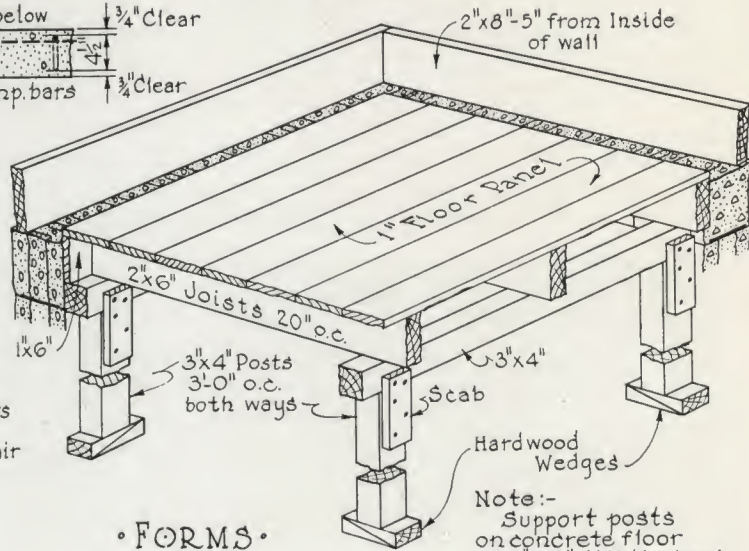
Note:- Tie all intersections of steel with #18 gauge black annealed wire.



• SECTION • AT • F-F •

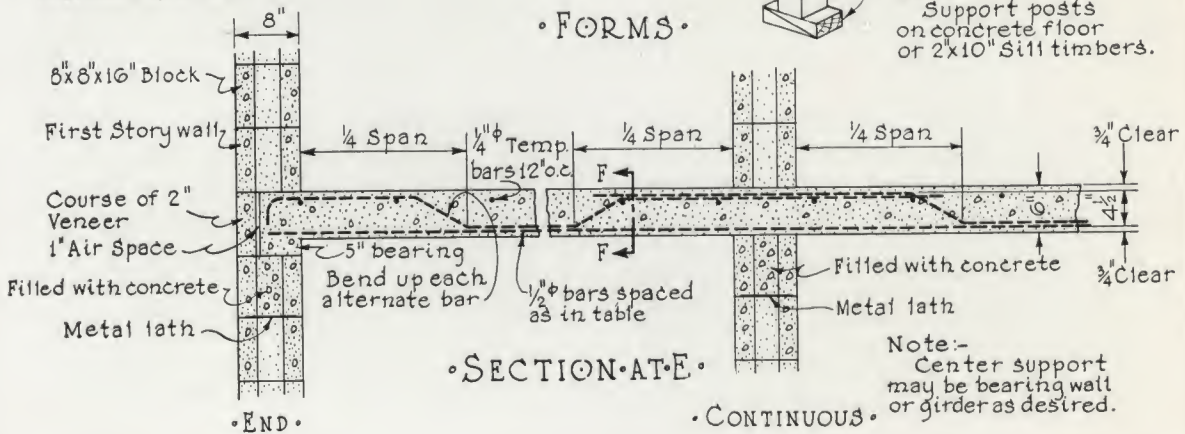
• LOADS •

This design for clear spans only, not carrying bearing partitions from floors above.
Use double bars and header bars at stair openings.
Maximum span 16'-0".



• FORMS •

Note:- Support posts on concrete floor or 2"x10" Sill timbers.

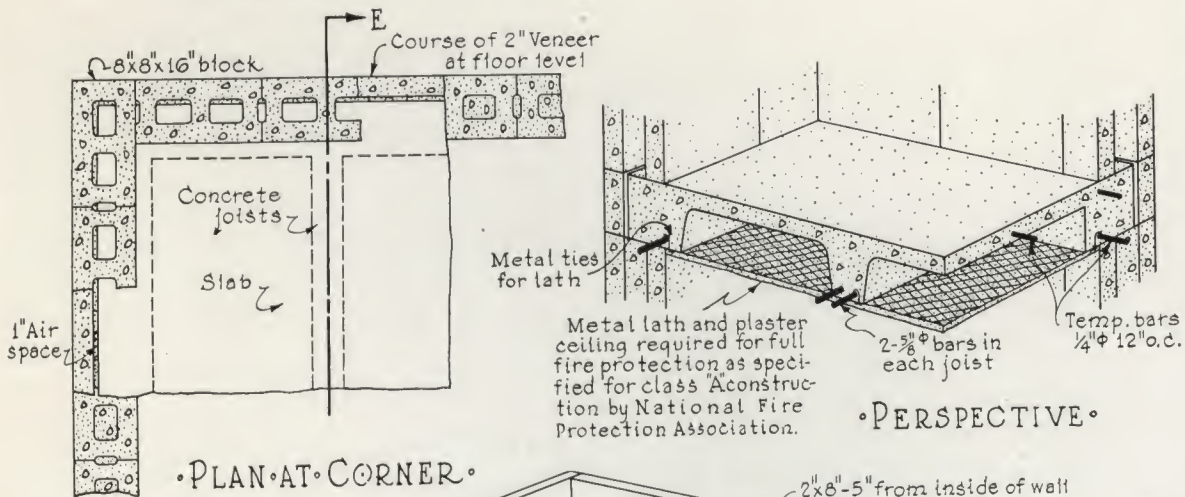


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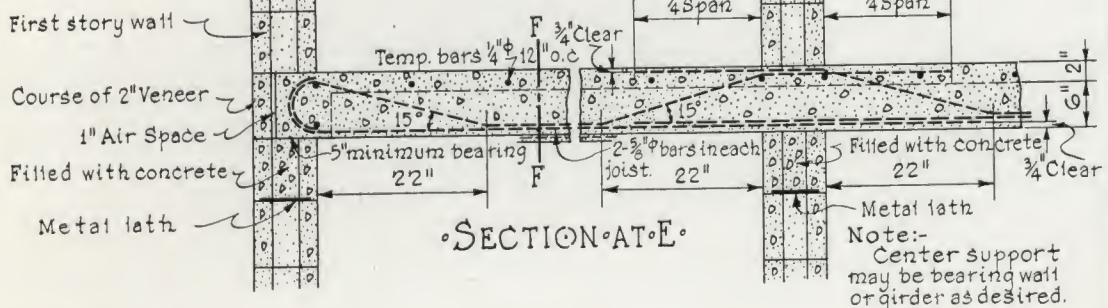
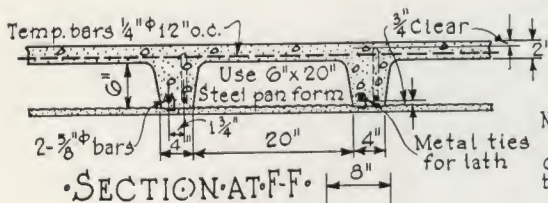
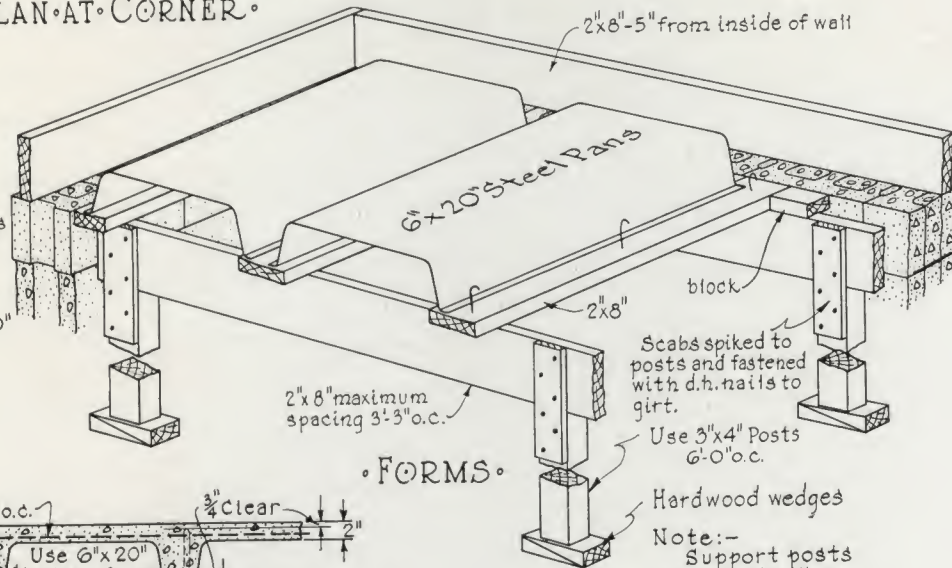
• CONTINUOUS •

Note:- Center support may be bearing wall or girder as desired.

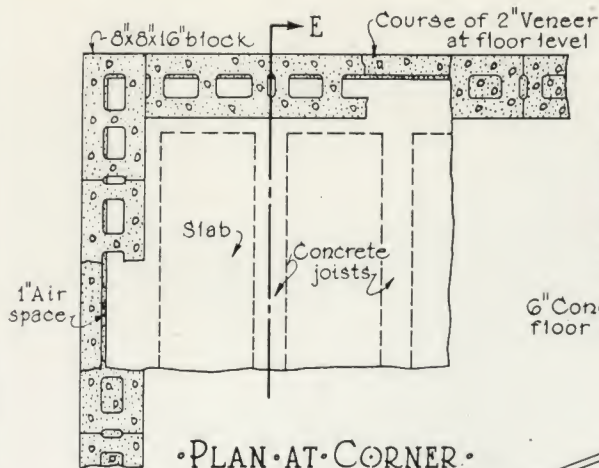
• RIBBED FLOOR CONSTRUCTION •



• LOADS •
 This design for clear spans only, not carrying bearing partitions from floors above.
 Use double joists and header joists at stair openings.
 Maximum span 16'-0"



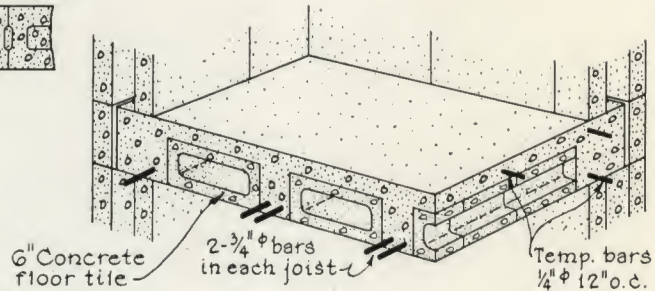
• TILE • AND • JOIST • CONSTRUCTION •



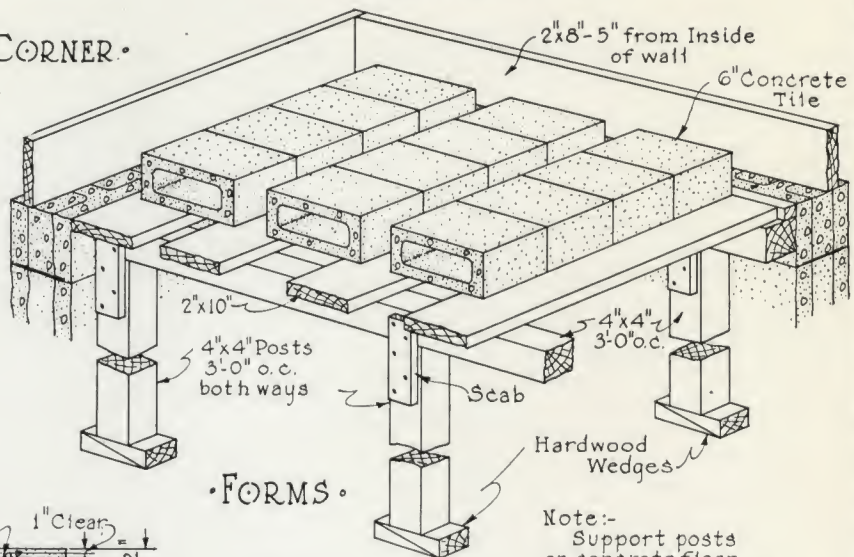
• PLAN • AT • CORNER •

• LOADS •

This design for clear spans only not carrying bearing partitions from floors above. Use double joists and header joists at stair openings. Maximum Span 16'-0".

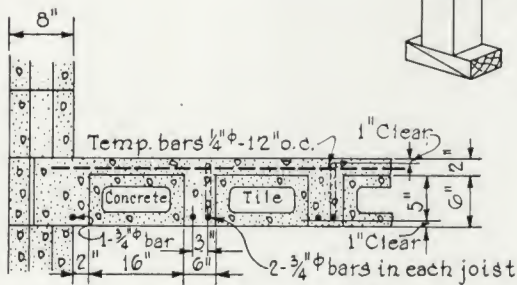


• PERSPECTIVE •



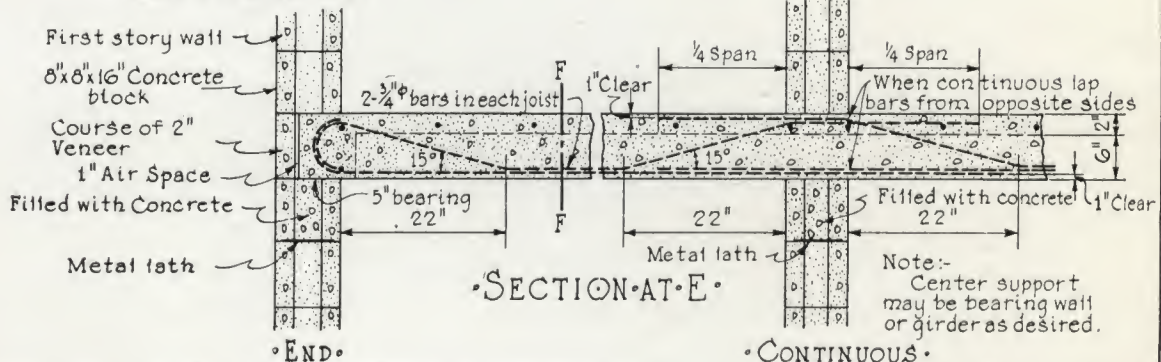
• FORMS •

Note:- Support posts on concrete floor or 2"x10" Sill timbers.



• SECTION • AT • F • F •

Note:- Tie all intersections of steel with #18 gauge black annealed wire.



• SECTION • AT • E •

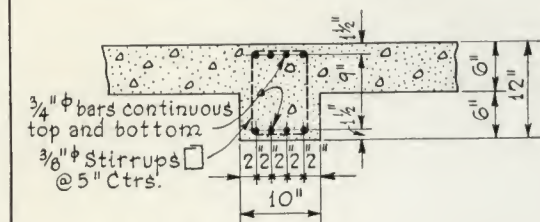
Note:- Center support may be bearing wall or girder as desired.

• CONTINUOUS •

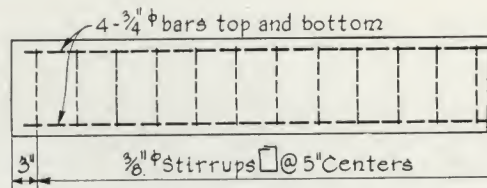
• BASEMENT BEAMS AND COLUMNS •

Use beams where floor joists are not carried by basement partitions, also under any first floor partition which carries load down from second floor and is not supported by basement partition.

Tie all intersections of steel with #18 gauge black annealed wire.

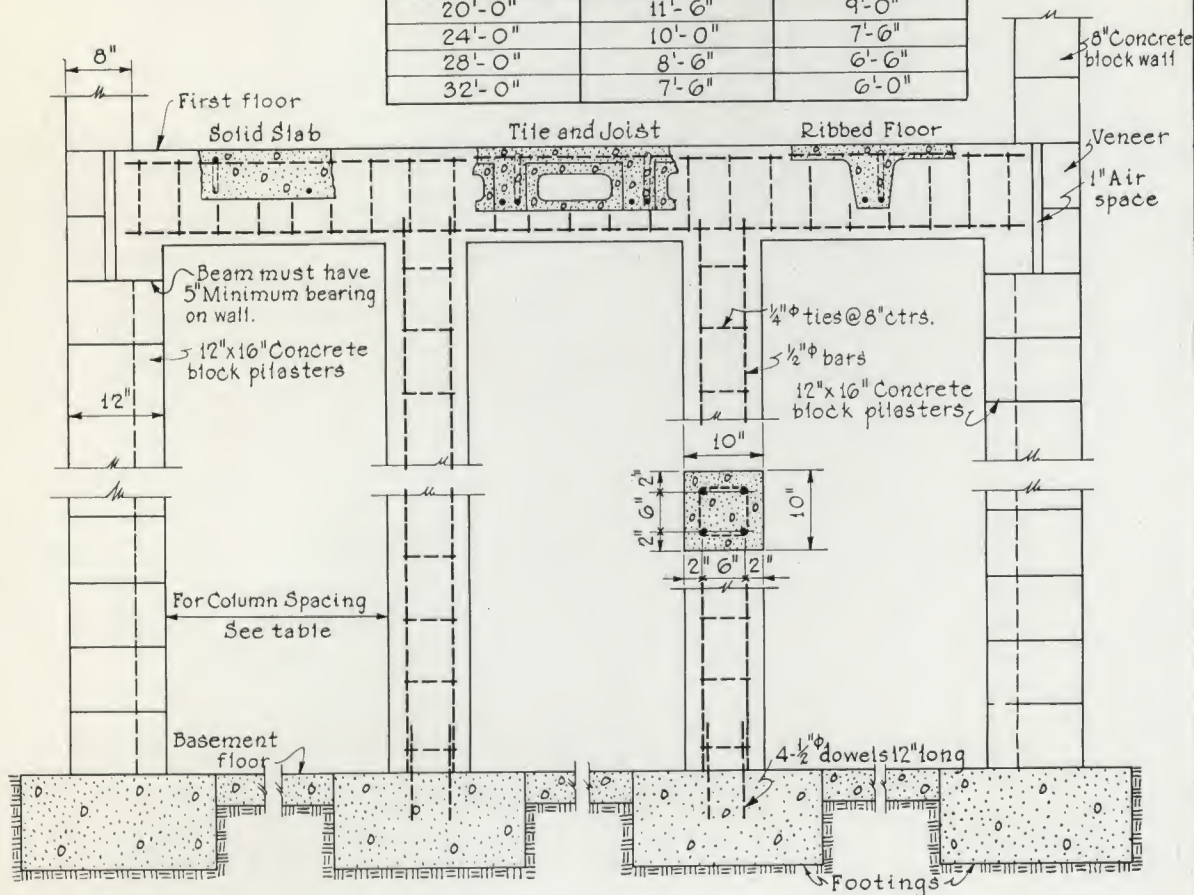


•DETAIL•OF•BEAM•
•SOLID•SLAB•SHOWN•



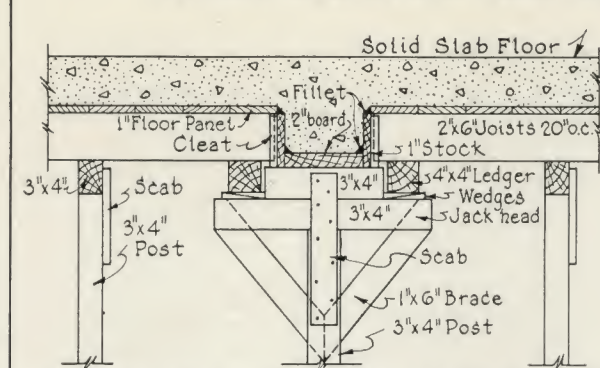
• ELEVATION • OF • BEAM •
• SHOWING • REINFORCEMENT •

SUM OF TWO ADJACENT FLOOR SPANS	SPACING OF COLUMNS C. TO C.	
	Single story	Two story
20'-0"	11'-6"	9'-0"
24'-0"	10'-0"	7'-6"
28'-0"	8'-6"	6'-6"
32'-0"	7'-6"	6'-0"

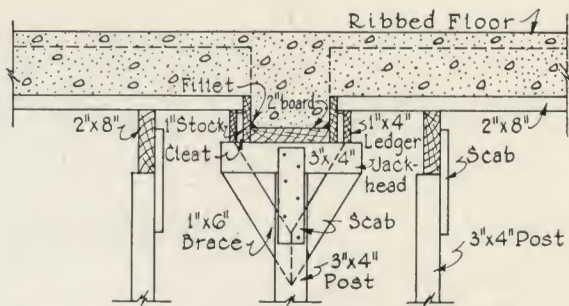


• ELEVATION SHOWING REINFORCEMENT OF COLUMNS AND BEAMS •

• FORM • DETAILS • FOR • BEAMS • AND • COLUMNS •

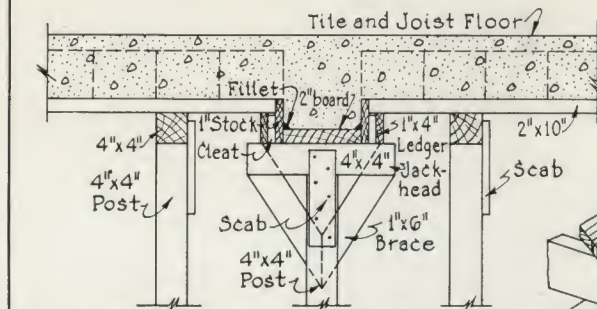


• CROSS SECTION OF FORM FOR BEAM •
• SHOWING SLAB FLOOR •

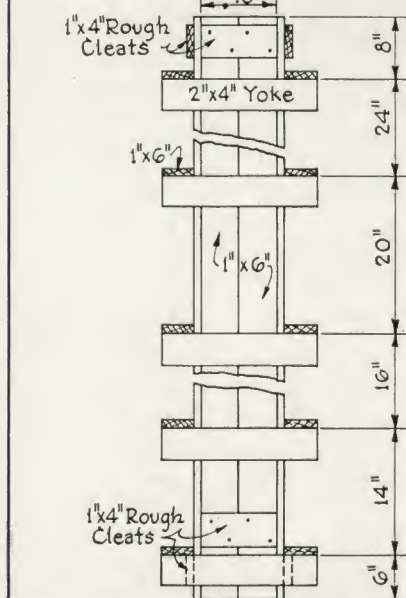


•CROSS SECTION OF FORM FOR BEAM.
•SHOWING RIBBED FLOOR.

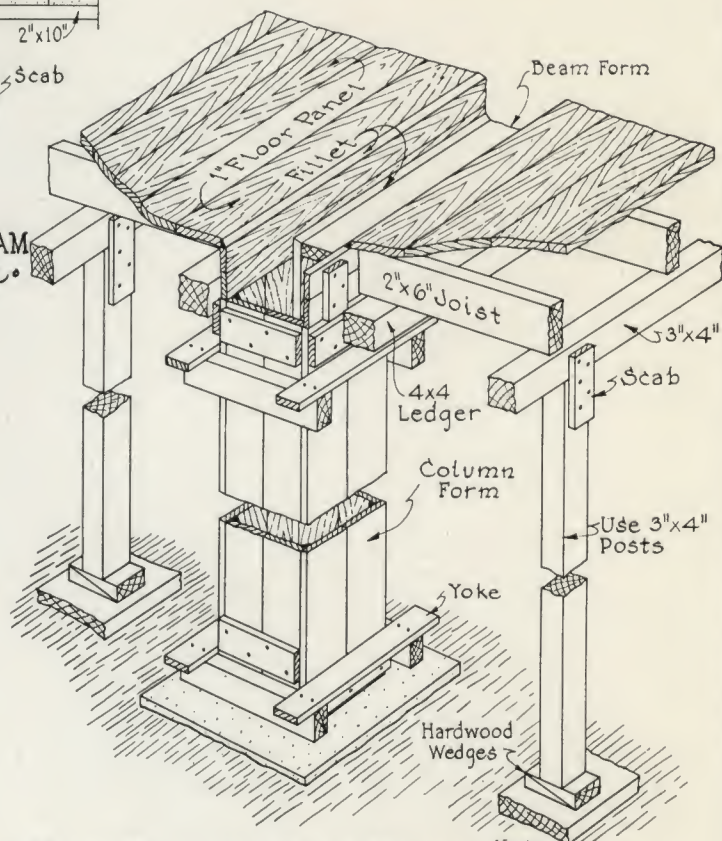
Note:- End sections of pans
used at junction of joists
with walls and girders.



CROSS SECTION OF FORM FOR BEAM
SHOWING TILE AND JOIST FLOOR.



• SPACING OF YOKES ON COLUMN •
• FORM 7'-6" HIGH •



•VIEW•SHOWING•SLAB•BEAM•
•AND•COLUMN•FORM•

•VIEW SHOWING SLAB BEAM
•AND COLUMN FORM

Note:- Support Posts
on Concrete
floor or 2"x10"
Sill timbers.

